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ABSTRACT

A study investigated the effect of instruction about conventional expository text structure on fifth-graders' ability to learn from similarly structured social studies material. Subjects, 82 fifth graders from four heterogeneous classrooms in two schools in a small midwestern city, were assigned to either a structure training group which received direct instruction in recognizing and summarizing a conventional problem/solution text structure or to a traditional training group which read and discussed answers to questions about social studies passages. Subjects then completed three criterion tests of learning from independent reading, and one test of learning from structured discussion. Data analyses supported the major hypothesis that instruction in a problem/solution text structure, including summarization instruction, would facilitate the formation of macrostructures for text having that structure. Specifically, findings showed that, compared to the traditionally trained group, the structure trained group (1) recalled approximately 50% more of the macrostructure ideas on an essay (probed recall) test over the passage; (2) recalled approximately the same amount of information on a short answer test over specific information not necessarily included in the macrostructure; (3) wrote summaries that included more main ideas from the passages; and (4) wrote better organized summaries. However, findings did not support the hypothesis that using the problem/solution text structure as an organizational framework for classroom discussion would facilitate retention of the content discussed. (Possible reasons for this finding are examined. Four pages of references and five figures are included.) (JD)

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CENTER FOR THE STUDY OF READING

Technical Report No. 394

DOES TEXT STRUCTURE/SUMMARIZATION INSTRUCTION FACILITATE LEARNING FROM EXPOSITORY TEXT?

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Abstract

This study investigated the effect of instruction in a particular text structure on fifth-graders' ability to learn from similarly structured social studies material. Eighty-two fifth graders were assigned to either a structure training group that received direct instruction in recognizing and summarizing a conventional text structure (problem-solution) or a traditional training group that read and discussed answers to questions about social studies passages. Results indicated that structure training enhanced students' ability to abstract the macrostructure of problem-solution text read independently, as measured by responses to a main idea essay question and by written summaries of two passages.

Does Text Structure/Summarization Instruction Facilitate Learning from Expository Text?

Most learning from reading, both in and out of school, depends on the ability to read and understand expository text. Although the empirical evidence is weak, experts contend that children generally have more difficulty reading expository text than narrative text (Spiro & Taylor, 1980). Many factors may contribute to children's difficulty with expository text, including insufficient prior knowledge, interest, or motivation. As suggested by recent research in learning from reading, another contributing factor may be that children lack sensitivity to text structure, the way the ideas in text are organized. The effect of text structure instruction on middle grade children's ability to learn from reading expository text is the focus of the study reported here.

Many current theories of reading comprehension assume, at least implicitly, that skilled readers automatically abstract a higher-order structure of the text (Meyer, 1975; Rumelhart & Ortony, 1977; van Dijk & Kintsch, 1983). This "macrostructure" (van Dijk & Kintsch, 1983) represents the "gist" of a text organized into a coherent whole. The macrostructure guides encoding, recall and reproduction of the essential points of the text. Formation of macrostructures is thus a prerequisite for success in tasks involving global comprehension and meaningful learning.

Middle grade children apparently have difficulty forming macrostructures for expository text. For example, several

studies have shown that children in middle grades have difficulty producing written summaries of expository text (Brown & Day, 1983; Winograd, 1984; Taylor, 1986). Children in the middle grades may have difficulty forming macrostructures for exposition because they have trouble identifying important information or finding the main idea in expository text. Indeed, in the aforementioned Winograd (1984) and Taylor (1986) studies, ability to identify important information was significantly related to ability to summarize text.

Other research on learning from expository text has demonstrated that sensitivity to the organization of ideas in text, and hence to the relative importance of information, is related to comprehension and memory. For example, several recent studies have examined the effect of readers' awareness of the author's text structure on ability to recall expository text (McGee, 1982; Meyer, Brandt, & Bluth, 1980; Taylor, 1980, 1985). In these studies, awareness of author's text structure was indexed by the readers' use of the author's structure in organizing their own recall protocols. In the study by Meyer, Brandt, and Bluth (1980), skilled ninth grade readers tended to use the author's top level structure in organizing their free recalls of expository texts, while readers with low comprehension skills did not. Furthermore, readers who employed the strategy of using the text's top level structure recalled more information than those who did not.

Taylor (1980) found the same effect for younger readers. Sixth grade good readers recalled more from short expository

passages after two days than sixth grade poor readers or fourth grade good readers. This differential recall appeared to be related to the sixth grade good readers' greater use of text structure in organizing their recalls: More sixth grade good readers organized their delayed recalls according to the higher order text structure than did sixth grade poor readers or fourth grade good readers. Also, both good and poor readers who organized their recalls according to the author's higher order text structure recalled more than readers who did not follow the text structure.

Similarly, McGee (1982) found that fifth grade good readers used the author's text structure more and recalled more total and superordinate idea units than fifth grade poor readers or third grade good readers. Finally, Taylor (1985) examined the ability of sixth graders and college students to summarize passages from a social studies textbook. Compared to college students, sixth graders had difficulty understanding important ideas and/or including these ideas in either oral or written summaries. A conclusion from the Meyer et al. (1980), Taylor (1980, 1985), and McGee (1982) studies is that age and reading ability are highly correlated with recall of expository material, perhaps because of skilled readers' greater awareness and use of the author's higher order text structure.

Other evidence for the importance of awareness and use of text structure in macrostructure formation comes from studies demonstrating that instruction about text structure can improve comprehension and recall. One approach to fostering awareness of

text structure is to teach readers to make some concrete representation of the organization of ideas in exposition. For example, with strategies such as Networking (Dansereau, Collins, McDonald, Holley, Garland, Diekhoff, & Evans, 1979) and mapping (Armbruster & Anderson, 1980; Berkowitz, 1986), readers generate a diagram representing basic ideas and relationships in text. These strategies appear to be at least moderately successful in improving readers' recall of expository text. One limitation of these strategies is that they do not necessarily help the reader identify the macrostructure; the reader extracts a structure, which may or may not represent the "gist" of the text.

Another approach to teaching text structure is to teach readers to use typographical cues (headings, subheadings, and paragraphs) as indices of text structure. This was the approach used by Taylor and her colleagues (Taylor, 1982; Taylor & Beach, 1984) in their "hierarchical summarization" research. The hierarchical summarization task consists of first preparing a skeleton outline based on headings, subheadings, and paragraphs, and then writing a main idea statement for every point on the outline. In experiments with fifth graders (Taylor, 1982) and seventh graders (Taylor & Beach, 1984), subjects who engaged in hierarchical summarizing tended to outperform control groups on some kinds of dependent measures. While the results of the research on hierarchical summarization seem promising, a limitation of the strategy is that it is highly dependent on the heading-subheading organizational format of the text and on the

ability of the headings and subheadings to convey the structure of the text.

A third approach to teaching text structure is to provide instruction in one or more conventional text structures. Conventional text structures for expository text include comparison-contrast, cause-effect, temporal sequence, problem-solution, description, and enumeration (Meyer, 1975; Englert & Hiebert, 1984). There are also conventional text structures for particular genres of expository text, such as newspaper articles and research reports. The potential of instruction in conventional text structures has been demonstrated in a few recent studies. For example, Brooks & Dansereau (1983) identified a "structural schema" consisting of the categories of knowledge important to understanding a scientific theory. College students trained in the use of this schema significantly improved their delayed recall of a scientific text. In a study by Barnett (1984), college students who received a brief description of the appropriate text structure before reading either a research report or a journal article recalled significantly more information after two days than either subjects who received the description about text structure after reading or who received no description of text structure. Finally, Bartlett (1978) found that teaching ninth graders four expository text structures increased their ability to identify and use the text's higher order structure and significantly increased the amount of information they remembered.

In summary, recent research suggests that sensitivity to text structure is an important component in text comprehension and memory, perhaps because readers who are sensitive to text structure are better able to form macrostructures for the text they have read. Furthermore, research suggests that readers as young as fifth graders can benefit from instruction in text structures.

The purpose of the present study was to investigate the effect of instruction about a conventional expository text structure (including instruction on summarizing) on fifth graders' ability to comprehend expository text having this structure. Instruction for the experimental group focused on a problem-solution structure, an organizational pattern commonly found in social studies textbooks. The structure conveys information about a problem that an individual or group encounters, how they attempt to solve the problem, and the results of the attempt to solve the problem. The problem-solution structure is described in Armbruster and Anderson (1985) and is mentioned in many other discussions of expository text structure (e.g., Meyer, 1975).

In the study, children were taught to recognize the problem-solution structure as well as to use the structure in organizing their own written summaries of what they had read. Structure training was compared with the more traditional practice of answering and discussing questions after reading.

The major hypothesis was that instruction in the problem-solution structure would facilitate the formation of a

macrostructure for text having a problem-solution structure. Therefore, compared to the traditionally trained group, the structure trained group should:

(a) recall more information on an essay (probed recall) test over the passage main idea,

(b) recall about the same amount of information on a short answer test over specific information not necessarily included in the macrostructure,

(c) write summaries that included more passage main ideas,

(d) write better organized summaries (i.e., summaries that have a recognizable structure).

An additional hypothesis was that using the problem-solution text structure as an organizational framework for classroom discussion should facilitate retention of the content discussed.

Method

Subjects

Fifth graders from four heterogeneous classrooms in two schools in a small midwestern city participated in the study. Children enrolled in remedial reading classes and/or scoring below a fourth grade reading level on the reading comprehension subtest of the most recently administered Gates-MacGinitie Test (2nd edition, Form D) were eliminated from the study, leaving a total of 82 subjects. Of the two classrooms in each school, one was assigned to the structure training treatment while the other received traditional training.

Materials

Instructional Materials

The instructional materials consisted of researcher-prepared "workbooks" for both structure training and traditional groups. The booklets for the structure training subjects contained: (a) a definition/description of the problem-solution text structure, along with a schematic representation ("frame") of the problem-solution text structure (see Figure 1); (b) explicit rules for how to write a summary of problem-solution passages, including a pattern for writing and guidelines for checking the summary (see Figure 2); (c) 13 problem-solution passages from fifth grade social studies textbooks, ranging in length from 100 to 500 words; and (d) copies of problem solution frames accompanied by blank lines for students to use in writing their summaries of the passages.

Insert Figures 1 and 2 about here.

The booklets for the traditional training group contained the same problem-solution passages as the structure training booklets. Each passage was accompanied by five questions. The questions were similar to questions asked at the ends of textbook lessons or chapters. Some of the questions asked about information critical to the problem-solution structure; thus, they tapped information similar to that which would be discussed in the structure training group. For example, the question "What did Governor Clinton decide to do?" asks about the action taken

to solve a problem. Other questions asked about particular facts that were not critical to the problem-solution structure, for example, "What two cities were connected by the National Road when it was completed?" Each question was accompanied by four blank lines for answers.

Dependent Measures

Two categories of dependent measures were used in the study. The first focused on learning from independent reading of a problem-solution passage. The second focused on learning from a whole-class discussion of a problem-solution text.

Tests of learning from independent reading. The first criterion test was designed to assess comprehension of the higher-order structure of a 525-word passage entitled "Homesteading the Plains," selected from a fifth grade social studies textbook. The following essay question was constructed to assess comprehension of the higher-order structure: "What were the problems that settlers faced on the Great Plains? How did they solve those problems?"

The second criterion test was a ten-item short answer test that tapped more specific information from the passage. Some of the questions probed recall of specific information related to the problems and solutions discussed in the passage. For example, the question "What did the settlers use instead of wood to build houses on the Great Plains?" asks for a specific solution to a specific problem. Other questions probed recall of information not directly related to the problem-solution structure, for example, "What is a homestead?" Two-thirds of the

21 possible points on the short answer test were assigned to questions that probed recall of information not directly related to the problem-solution structure.

The third criterion test was designed to assess students' ability to write summaries of problem-solution passages. The material to be summarized was two 200-word passages selected from fifth grade social studies textbooks, one on the problem of obtaining food in Haiti, and the other on the problem of getting oil from Alaska.

Tests of learning from structured discussion. The fourth criterion test was designed to assess students' ability to remember information from a section of their regular classroom textbook which had been read and discussed in class. The section described problems encountered by settlers in Jamestown. The test was an essay question: "Describe two problems that the English colonists faced in the early years of the Jamestown settlement. How did they solve those problems?"

Procedure

Instruction

One of the authors instructed both structure training and traditional groups in their normal classrooms with the regular teacher present. The instruction took place over 11 consecutive school days for 45 minutes per day per class.

The instruction for the structure training subjects followed principles of explicit or direct instruction (Duffy & Roehler, 1982; Pearson, 1984; Pearson & Gallagher, 1983; Rosenshine & Stevens, 1984; Rosenshine, 1986). That is, the instruction

featured teacher modelling of explicitly defined procedures, plenty of guided practice on increasingly longer, more difficult passages, teacher monitoring with corrective feedback, and independent practice.

Specifically, the structure training instruction proceeded as follows:

Day 1. The teacher introduced herself and provided a rationale for the project (i.e., social studies texts discuss many problems and solutions; learning about problem-solution structures will help students focus on main ideas and remember important information). Using the first example of a problem-solution text in the workbook, the students discussed answers to the questions: Who has a problem? What is the problem? What actions were taken to solve the problem? and What were the results of those actions? The teacher explained that these four questions are always associated with problem-solution texts. Then the teacher introduced the problem-solution frame (Figure 1) and told the students the diagram would help them organize answers to the four problem-solution questions. The teacher demonstrated how answers to discussion questions could be recorded in the frame. Students filled out the frame in their workbooks.

Day 2. The teacher briefly reviewed, then led a discussion of the second passage in the workbook, recording answers to problem-solution questions in a frame on the blackboard. The teacher explained to students that one way to learn from reading textbooks is to summarize the information. The teacher explained

the guidelines for summarizing problem-solution passages (Figure 2) and modeled writing and checking summaries based on the two passages already "framed" in the workbook. The students copied the summaries in their notebooks. The teacher then led a discussion of the third workbook passage, recording information in a frame on the blackboard. The teacher elicited a summary from the class and recorded it on the board. The class used the guidelines to check the summary; then the students copied the summary in their workbooks.

Days 3 - 9. Students continued to work consecutively through the workbook, following three steps for each passage: read passage silently, looking for information to answer the problem-solution questions; recorded notes on passage in provided problem-solution frames; wrote summary of framed information. Students gradually assumed greater independence in the last two steps. As students worked independently in their workbooks, the teacher circulated and monitored individual work, providing corrective feedback and assistance as needed. Students were also reminded to check their own summaries using the provided guidelines. After each passage had been independently framed and summarized, the teacher asked two or three students to write their frames and/or summaries on the board. (Sometimes the summaries were given orally.) The class then discussed and provided feedback on the efforts. By the end of Day 9, all passages in the workbook had been read, framed, and summarized.

Days 10 - 11. Students returned to their classroom textbook to the place where regular social studies instruction had stopped

prior to the intervention. Discussion after silent reading was organized around the problem-solution frame. The teacher recorded the discussion points in a frame on the blackboard; then students orally summarized the frame. (The topic of the problems of the early Jamestown settlers was read and discussed on the final day of instruction.)

Meanwhile, the traditional training group worked from their own version of the workbooks for the first nine days of instruction. Instruction for the traditional training students proceeded in the following manner. After silently reading the passages, the traditional training students discussed the answers to five questions accompanying each passage. To control for practice in writing, traditional training students were also asked to write complete answers to all questions. As with the structure training group, the traditional training group assumed greater independence throughout the project; they also received corrective feedback and assistance from the teacher. On the last two days of instruction, the traditional training group also returned to the regular classroom textbook to study the same material the structure training group was studying.

Therefore, instruction for the traditional training group was "traditional" in that it entailed reading and discussing answers to questions. The traditional training group served as a control because the students read the same material as the structure training subjects to control for practice with problem-solution text structures, and they wrote answers to questions to control for writing practice.

Testing

Testing was begun immediately after the 11 days of instruction. On the first day of testing, subjects were asked to read and study the passage "Homesteading the Plains" in preparation for a test. Structure training subjects were encouraged to use the strategy they had been learning. Traditional training subjects were told to use any strategy they wished; notetaking and underlining were mentioned as possibilities. All subjects received blank paper to use in any way they saw fit as they studied the passage. After 18 minutes, the passage and all notes were removed and the essay question distributed. Subjects had 12 minutes to answer the essay question. Then the essay question was collected and the short answer test distributed. Subjects had 12 minutes to complete the short answer test. All 82 subjects completed these two criterion tests.

On the second day of testing, subjects were given one of the two 200-word passages to summarize and paper containing 50 blank lines. Subjects were told to read the passage and write a summary. They were told that their summary could be shorter, but not longer, than 50 words, and that they should write the summary on the provided paper, using complete sentences. A summary was defined for all subjects as a shorter form of the original passage that contains only the most important points. After 20 minutes, passages and summaries were removed and the second passage was distributed. Subjects were told to read and study the passage in preparation for writing a summary from memory.

After 10 minutes, the passage was removed, and the paper with the 50 blank lines was distributed. Subjects had 10 minutes to write their summaries. For this criterion test, then, one passage was summarized with the text present while the other was summarized without the text. Eighty subjects completed this criterion test.

The final criterion test was administered six days after the completion of instruction. Subjects were given the essay question about the problems of the Jamestown settlers. All subjects had read and discussed this topic, which was from their classroom textbook, on the final day of instruction. Subjects were given 15 minutes to write their answers. Seventy-nine subjects completed this criterion test.

Scoring

The essay and short answer tests were scored by two of the authors using answer keys. For the first essay test, the total possible score was 39 points (one point for each of 39 total idea units); for the short answer test, 21 points (one point for each of 21 total idea units); and for the second (delayed) essay test, 28 points (one point for each of 28 possible idea units). Interrater agreement for the first essay test was 89%, for the short answer test, 96%, and for the second (delayed) essay test, 85%. Disagreements were resolved in conference.

The summaries were scored for relative importance of ideas using the following procedure. First, the two passages were parsed into "idea units," which were basically independent clauses. The idea units were listed in the order in which they

appeared in the passage. Five adults were asked to read the two passages and then rate the relative importance of the idea units using a modification of the procedure introduced by Johnson (1970). Specifically, the adult raters were asked to place a "1" beside the n idea units (n = 1/4 of the total idea units) that were most important to the meaning of the passage, a "2" beside the n idea units that were next most important, and so on for the four levels of importance. The adult ratings were then averaged to produce a master scoring key for each passage.

Next, the subjects' summary protocols were parsed into idea units. Two scorers sorted the idea units from the summary protocols into one of the four categories of importance identified on the master key, or into a fifth category of extraneous ideas. Extraneous ideas consisted of information that was not present in the original passage, including distortions and intrusions. For a random sample of 50 summaries (about one-third of the total), interrater agreement was 94%.

The summaries were also evaluated for quality of writing using the Rating Guide for Functional Writing as developed for the Illinois Writing Assessment Program (Illinois State Board of Education, 1984). The Rating Guide generates subscores for focus, support, and organization, as well as an overall holistic, or integration, score. Each subscore indexes a different feature of the written piece. The focus score reflects the clarity of the subject and main points; the support score indicates the quantity and quality of the supporting information; and the organization score reflects the use of structure, transitions,

and logic in the piece. The integration score indexes the overall development and integration of the features. Each scale has a range of 1 (low) to 6 (high). Typed versions of the summaries were scored blind by two classroom teachers (not otherwise associated with the study) who had been trained by the State of Illinois in this rating procedure. The teachers worked together to score each summary.

Data Analysis

Because each student had not been randomly assigned to a treatment condition, the mean reading comprehension ability of each of the four classrooms was computed and compared. Scores on the most recently administered reading comprehension subtest of the Gates-MacGinitie Test (2nd edition, Form D) were used for this purpose. A one-way ANOVA with four levels of classrooms revealed no significant differences among classrooms; we concluded that there were no major differences in reading ability among the four groups of students. [The classroom means and standard deviations were 26.2 (5.8), 30.7 (6.3), 30.7 (5.5), and 30.1 (6.3).] In order to examine the effect of reading comprehension ability, however, subjects were sorted into three ability levels (low, medium, and high) on the basis of their Gates-MacGinitie scores.

Various forms of mixed analyses of variance with unweighted means were used to analyze the data. In all analyses in which the condition of homogeneity of variance was not satisfied, the Greenhouse-Geisser (1959) degrees of freedom adjustment factor was used, and the resulting conservative F-value was reported. Differences between individual group means were tested by pooling

sums of squares and using the Newman-Keuls multiple comparison technique (Glass & Hopkins, 1984).

Results

The results are discussed under the two main categories of dependent measures: measures of learning from independent reading and measures of learning from a classroom discussion of a problem-solution passage.

Learning From Independent Reading

Essay Test

Scores consisting of percent correct of total possible points (39) on the essay test for the "Homesteading the Plains" passage were analyzed using a three factor (between groups) ANOVA design: two schools, three levels of ability, and two training conditions. Results showed significant main effects for training condition, $F(1,70) = 7.24$, $p = .009$, and ability, $F(2,70) = 17.45$, $p < .0001$. The structure training group scored higher than the traditional training group (means = 37.4 >> 25.6).[1] The high ability students scored significantly higher than the medium ability students, $p < .01$, who scored significantly higher than the low ability students, $p < .01$; means = 46.9 >> 32.6 >> 15.2. There were no other significant main effects or interactions.

Short Answer Test

Percent correct scores on the ten-item (21 point) short answer test were analyzed using a three factor (between groups) ANOVA design: two schools, three levels of ability, and two training conditions. Results showed a significant main effect for ability, $F(2,70) = 28.8$, $p < .001$. High ability students

scored significantly higher than medium ability, $p < .01$, who scored significantly higher than low ability, $p < .001$; means = 68.6 > 49.5 > 25.8. No other main effects or interactions were significant.

Written Summaries Test--Importance Levels

For the summaries, we were interested in a relative index of how subjects chose to distribute ideas across importance levels, given limited space. Recall that the summary protocols were restricted to a maximum of 50 words; most students wrote to this limit. The protocols were parsed into idea units and sorted into five categories: four normed levels of importance (Levels 1 to 4) and a fifth category for extraneous ideas (Level 5). The score for each category was converted into a "percent of total" metric. Therefore, these repeated measures composed an ipsative, ordered set in that the sum of all five category scores was equal to 100 for each student and the levels ranged in importance of idea units from 1 (most important) to 5 (extraneous).

There were five factors in this analysis. The three between group factors were: two schools , two training conditions, and three ability groups. In addition there were two within-subjects factors: five levels of importance and two summarizing conditions (with and without text). Since the main dependent measure is ipsative, the test of the experimental hypotheses (represented by the training and summarizing conditions factors) is to determine whether or not there are significant changes in the pattern or profile of the importance factor. Therefore, there will be no significant main effects for school, training, ability, and

summarizing conditions; the main focus of the analysis is on the interaction of the importance factor with the other four factors.

Results revealed a significant main effect for importance level, $F(4,272) = 45.5$, $p < .0001$. Subjects included a significantly higher percentage of idea units at Level 1 (most important) than at the other four levels. None of the other four means was significantly different from each other (unweighted means = 40.6 >> 14.7 ~ 13.1 ~ 14.9 ~ 16.8).

The significant training by importance interaction, $F(4,272) = 17.5$, $p < .0001$, is characterized by a tendency for the structure training group to have more Level 1 (most important) idea units, $p < .001$, and fewer Level 4 (least important) idea units, $p < .001$, in their summaries than the traditional training group. However, the structure training group also included significantly more Level 5 (extraneous) idea units, $p < .05$. Unweighted means for the structure training group for the five importance levels were: 46.7 >> 15.8 ~ 11.6 > 3.5 << 21.7. Unweighted means for the traditional training group were: 34.5 >> 13.7 ~ 14.6 << 26.4 >> 11.9.

There was also a significant importance by summarizing conditions interaction, $F(4,272) = 19.07$, $p < .00001$. When subjects wrote summaries with text available, the profile of importance level decreases from a high at Level 1 to a low at Level 5 (unweighted means for importance levels = 38.3 >> 21.1 17.0 ~ 17.7 >> 5.9). However, when subjects wrote summaries from memory (text unavailable), the profile of importance levels shows many Level 1 (most important) and Level 5 (extraneous) idea

units, but few idea units at Levels 2, 3, and 4. (Unweighted means for importance levels = 42.9 >> 8.4 ~ 9.3 ~ 12.2 << 27.7.) The summarizing conditions differed significantly at Levels 2 and 5, $p < .001$.

As shown in Figure 3, there was a significant triple interaction involving the training, importance, and summarizing condition factors, $F(4,272) = 3.17$, $p = .01$. As discussed above, the significant interaction of importance profiles due to summarizing conditions is apparent, but superimposed on that interaction is the effect due to training. When the structure training group did not have a text available, they included significantly more extraneous idea units than the traditional training group, $p < .001$; however, both groups included significantly more Level 5 idea units without tne text than with the text, $p < .001$.

Insert Figure 3 about here.

The interaction between importance level and ability was significant, $F(8,272) = 4.22$, $p = .0001$. The profiles show that the high and medium ability groups performed at about the same level while the low ability group had significantly fewer Level 1 idea units than the high ability group, $p < .05$. For the medium and high ability students, the difference between the percentage of Level 1 and Level 5 idea units was large and significant, $p < .001$. However, the low ability group showed no significant

difference between the percentage of Level 1 and Level 5 idea units in their summaries.

The triple interaction among the importance level, ability and summarizing condition factors was also significant, $F(8,272) = 2.79$, $p = .006$. As illustrated in Figure 4, the profiles of importance levels when the text was available showed no significant differences among the three ability levels. The profile curves generally decreased smoothly from Level 1 to Level 5. Only the high ability group had significantly more idea units at Level 1 than at any other level, $p < .001$.

Profile curves based on the summaries when the text was not available showed a very different pattern. Each ability group portrayed a U-shaped profile curve due to higher percentages of Level 1 and Level 5 idea units. However, the critical difference among these three profile curves was that the high and medium groups had significantly more Level 1 ideas than any other level, $p < .01$, while the low ability students had a significantly higher percentage of idea units at Level 5 than at any other level, $p < .05$.

Insert Figure 4 about here.

Written Summaries Test--Quality Ratings

Recall that the summaries were also rated on four dimensions of quality: integration, focus, support/elaboration, and organization. These measures were analyzed in a five-way ANOVA. Three factors, schools, training conditions, and ability were

between groups factors and two factors, quality dimensions and summarizing conditions, were within subjects factors.

Results show significant main effects for quality dimensions, $F(3,198) = 69.3$, $p < .00001$; ability, $F(2,66) = 6.8$, $p = .002$; and training condition, $(1,66) = 99.8$, $p < .00001$. Unweighted means for the four quality conditions of focus, organization, integration and support/elaboration were 2.63 2.42 >> 1.96 > 1.71, respectively. The unweighted means for the high, medium, and low ability groups were 2.46, 2.29, and 1.82, respectively. Finally, the structure training group received much higher ratings (unweighted means = 2.64 >> 1.74) than did the traditional training group.

The interaction between training condition and summarizing condition was significant, $F(1,66) = 6.81$, $p = .01$. While the structure training group wrote better summaries in both summarizing conditions, they wrote slightly better ones with the text available than without it. On the other hand, the traditional training group wrote slightly lower quality summaries with the text available.

The significant interaction between quality dimensions and training conditions showed that the structure training group scored significantly higher than the traditional training group, $p < .01$, on all quality categories except the category of support/elaboration.

The significant interaction between ability and quality dimensions, $F(6,198) = 2.67$, $p = .03$, showed that the ratings on the dimensions of integration, focus, and support/elaboration

were not significantly different for the three ability levels. On the dimension of organization, however, the high ability group scored significantly higher than the low ability group, $p < .01$, but not significantly higher than the medium ability group. The medium ability group was not significantly different from the low ability group.

Learning from Classroom Discussion

The percentage of idea units remembered after a classroom discussion about a problem-solution passage were analyzed in an ANOVA with three between groups factors: schools, training, and ability. Results from the analysis showed only a weak ability main effect and no significant interactions. The ability effect was marginally significant at the 0.06 probability level. Unweighted means for the low, medium, and higher ability groups were 13.7, 14.6, and 21.6, respectively.

Discussion

The data analyses provide evidence to support the major hypothesis that instruction in a problem-solution text structure, including summarization instruction, would facilitate the formation of macrostructures for text having that structure. The evidence comes from confirmation of four out of the five hypotheses.

The first hypothesis was that compared to the traditional training group, the structure training group should recall more information on an essay test over the main idea of a problem-solution passage. Results revealed that compared to traditional training students, structure trained students recalled about 50%

more of the macrostructure ideas of a 525-word textbook passage read independently. Furthermore, the training was effective for all three ability groups, for although there were main effects for treatment and ability, treatment and ability did not interact.

The second hypothesis was also confirmed. While structure training facilitated essay test performance, it did not affect performance on the short-answer test. Recall that most of the items on the short answer test asked for specific, macrostructure-independent facts. It was not expected that text structure training would necessarily facilitate recall of this type of information.

The third hypothesis was that compared to the traditional training group, the structure training group should write summaries that included more passage main ideas. Indeed, the structure training group included significantly more Level 1 (most important) and significantly fewer Level 4 (least important) idea units in their summaries. Apparently, instruction in the problem-solution structure helped students extract the main points of problem-solution passages.

However, compared to the traditional training group, the structure training group also included more Level 5 (extraneous) idea units in their summaries. The tendency for structure training students to include more Level 5 idea units in their summaries was especially evident in interactions with summarizing condition: Structure training students tended to include more Level 5 idea units when the text was unavailable (Figure 3).

Also, lower ability students in particular had difficulty when the text was unavailable (Figure 4). This effect may be due to the fact that summarizing condition was confounded with passage (recall that subjects summarized one passage that was available and a different passage that was no longer available). Therefore, differential performance in the two summarizing conditions could be attributable to passage differences. However, we believe that the following explanation is also consistent with these results. The structure training group had learned the kind of information that is included in a problem-solution text and that should be in their summaries; however, in the independent reading situation, it was still up to them to instantiate the frame with the appropriate information. When the text was unavailable, structure training students may have suffered from one or both of the following problems: (a) failure to instantiate the frame with the appropriate information at encoding, or (b) failure to recall the appropriate information to instantiate the frame at retrieval. In other words, when structure training students did not sufficiently understand and/or remember the actual passage content, they tended to instantiate the problem-solution frame with extraneous information.

An example of a summary text that supports this explanation is presented in Figure 5. This summary was written by a student from the lower ability group when the text was unavailable. The student has clearly learned the instructed problem-solution frame but is badly confused about the content. (The passage discussed

the problem of getting oil from Alaska to other states; Texas was mentioned merely as another oil-producing state.)

Insert Figure 5 about here.

The results also confirmed the fourth hypothesis: Compared to the traditional training group, the structure training group should write better organized summaries. The results showed that the structure training group received much higher quality ratings on the dimension of organization, as well as on focus and integration. However, the significant ability by quality dimensions interaction showed that the instruction was not equally effective for all ability groups. While the low ability group did as well as the high ability group on the dimensions of integration, focus, and support/elaboration, they did not do as well on the important dimension of organization.

We qualify conclusions about the quality of summary writing by observing that the Illinois Writing Assessment Program's Rating Guide for Functional Writing may not be very appropriate for rating summaries. One reason for our suspicion is that the composite means for the ratings were so low: For the high, medium, and low ability groups, the means were 2.46, 2.29, and 1.82, respectively, out of a possible 6 points. While these low means could reflect relatively poor quality summaries, they could also indicate an invalid index of summary quality. Another reason for our suspicion is that categories such as focus and support/elaboration do not seem appropriate for summaries.

Despite possible problems with the rating scale, however, the scores do appear to reflect relative differences in the quality of the written summaries.

Our final hypothesis was that using the problem-solution text structure as an organizational framework for classroom discussion should facilitate retention of the content discussed. The data do not support this hypothesis. The reason for this result may be that the particular classroom discussion that was the basis for the criterion test was not very different for the structure training and traditional training groups. For both groups, the classroom discussion centered around a selection from the regular classroom textbook about the settlement of Jamestown. The selection was clearly about problems and solutions; in fact, two of the four subheadings were "What problems did these early settlers have to solve?" (problems) and "What new plan helped to make the colony a success?" (actions and results). Therefore, a legitimate classroom discussion of the selection would have to focus on problems and solutions. In fact, the only real difference between the discussions for the treatment groups was that, for the structure training group, the teacher-researcher recorded discussion points in a frame on the chalkboard--apparently not a very powerful difference.

Another possible explanation is that students need to be actively involved in the formation of the macrostructure if they are to benefit from it. In an independent reading situation, students <u>are</u> actively involved; they have to generate the problem-solution structure on their own. In a lecture situation,

the class worked collectively to fill in the problem-solution frame; therefore, most individuals were probably less actively involved.

In general, then, the results of this study suggest that direct instruction of a conventional text structure can facilitate formation of a macrostructure for that type of text. Fifth graders were successfully taught to form a macrostructure for problem-solution textbook passages read independently, as assessed by both an essay question over main points and a summarization task. For the essay question task, the instruction was effective for all ability groups. For the summarization tasks, the instruction was least effective for the low ability group. This result is not surprising; other research has demonstrated the difficulty of the task of summarizing, particularly for younger and less able students (Brown & Day, 1983; Brown & Smiley, 1977, 1978; Brown, Day, & Jones, 1983). For lower ability students, the instruction should probably provide considerably more practice and feedback.

There were two components to the instruction in this study: recognizing a text structure and using a text structure to write summaries. Future research should investigate the distinctive contribution of each component. Meanwhile, as we await further research, the results of the present instructional program should be encouraging to educators concerned with reading (and writing!) in content area classrooms.

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Footnotes

[1]In reported means from multiple comparison analyses, the sign ">>" indicates "greater than" at $p < .01$; the sign ">" indicates greater than at $p < .05$; the sign "~" indicates no significant differences between means.

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Figure Captions

Figure 1. Problem-solution frame

Figure 2. Guidelines for summarizing problem-solution passages

Figure 3. Interaction among summarizing, training, and importance level factors

Figure 4. Interaction among ability, importance levels, and summarizing factors

Figure 5. Example of a text-unavailable summary written by a structure training, low ability student

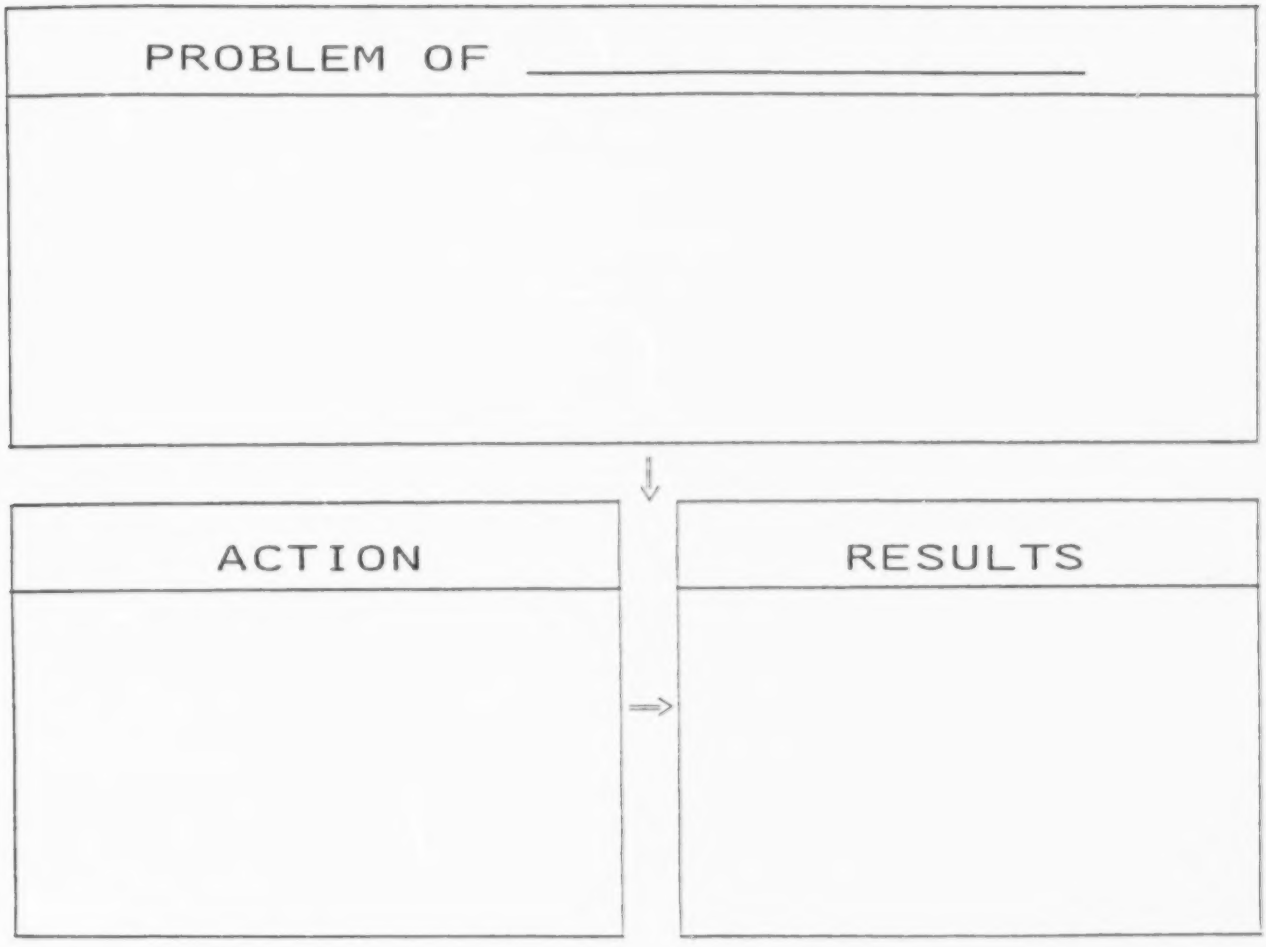

Figure 1

Figure 2

How to Summarize Problem-Solution Passages

Sentence 1 - Tells who had a problem and what the problem is.

Sentence 2 - Tells what action was taken to try to solve the problem.

Sentence 3 - Tells what happened as a result of the action taken.

Pattern for Writing a Summary of a Problem-Solution Passage

_____ had a problem because _____.

Therefore, _____.

As a result, _____.

Guidelines for Checking Summaries of Problem-Solution Passages

Check to see that:

1. Your summary has all of the information that should be in a summary of a problem-solution passage. (See "How to Write a Summary of a Problem-Solution Passage.") Compare your summary with the original Problem-Solution passage to make sure that the summary is accurate and complete.

2. You have used complete sentences.

3. The sentences are tied together with good connecting words.

4. The grammar and spelling are correct.

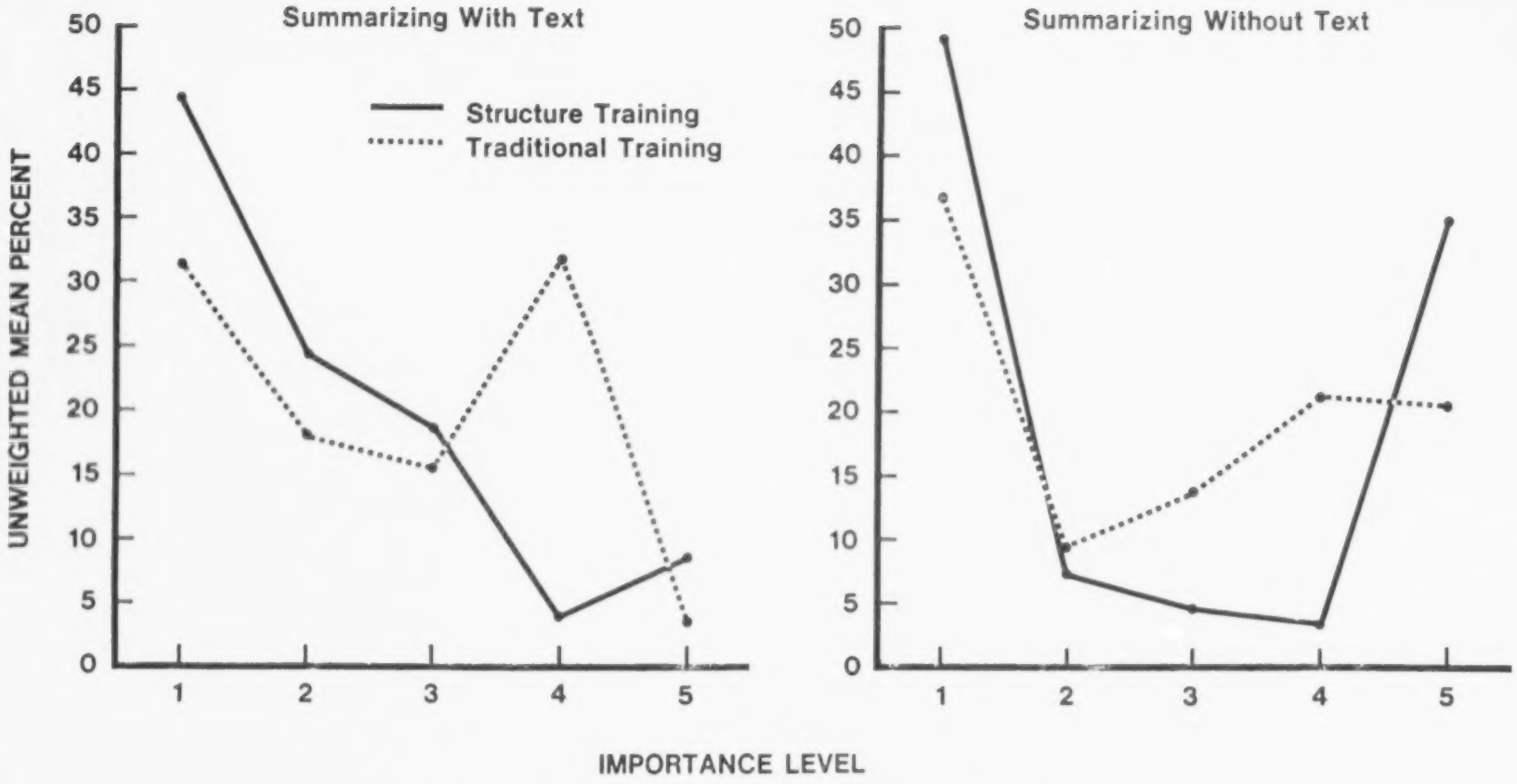
Summarizing With Text
Structure Training
Traditional Training
UNWEIGHTED MEAN PERCENT
50
45
40
35
30
25
20
15
10
5
0
1
2
3
4
5
Summarizing Without Text
IMPORTANCE LEVEL

Figure 3

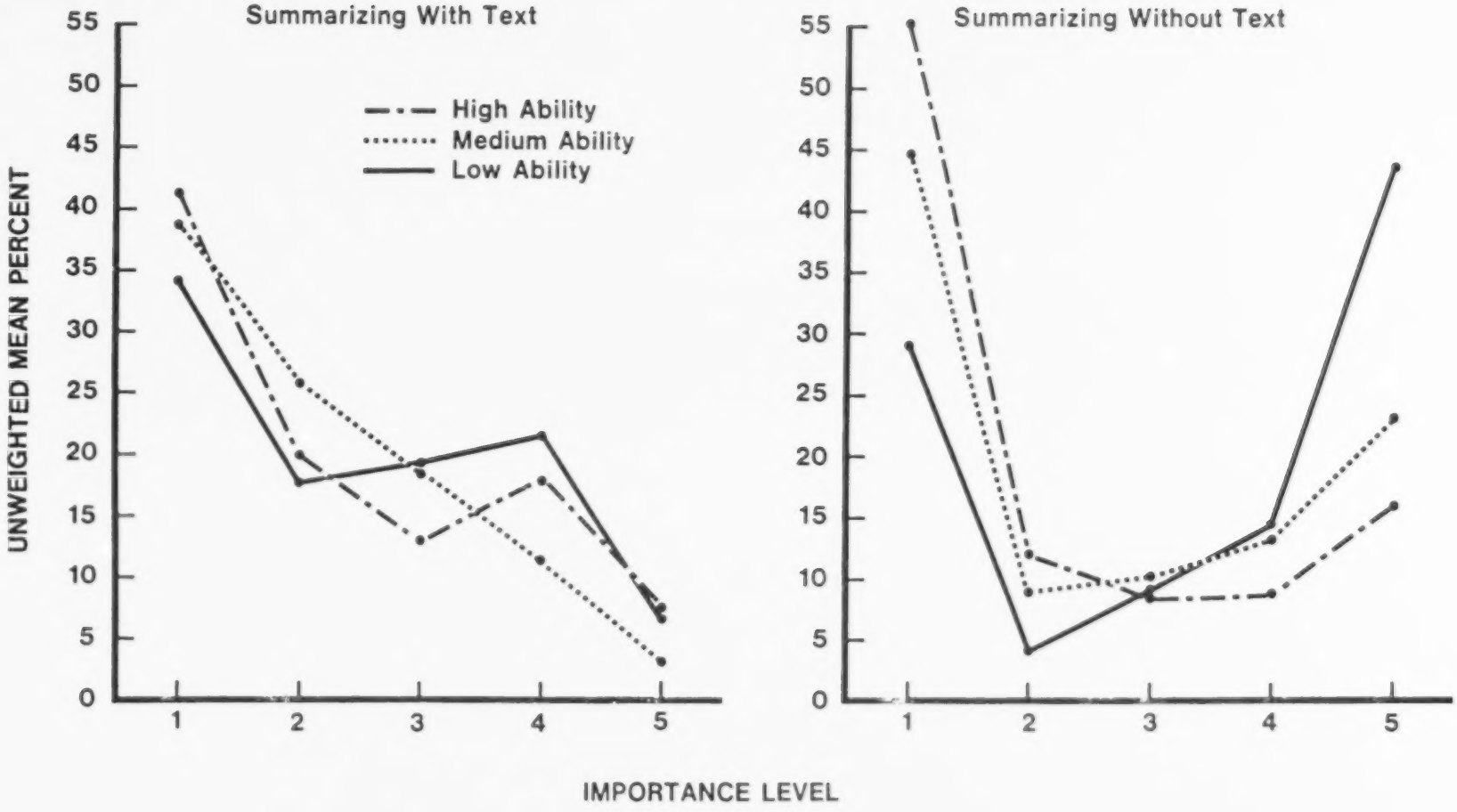
Summarizing With Text
Summarizing Without Text
High Ability
Medium Ability
Low Ability
UNWEIGHTED MEAN PERCENT
IMPORTANCE LEVEL
0
5
10
15
20
25
30
35
40
45
50
55
1
2
3
4
5

Figure 4

The Alskans had a problem because they couldent get oil from texas therefore they built pipe lines as a result the oil was pumped from texas to Alaska. (sic)

Figure 5